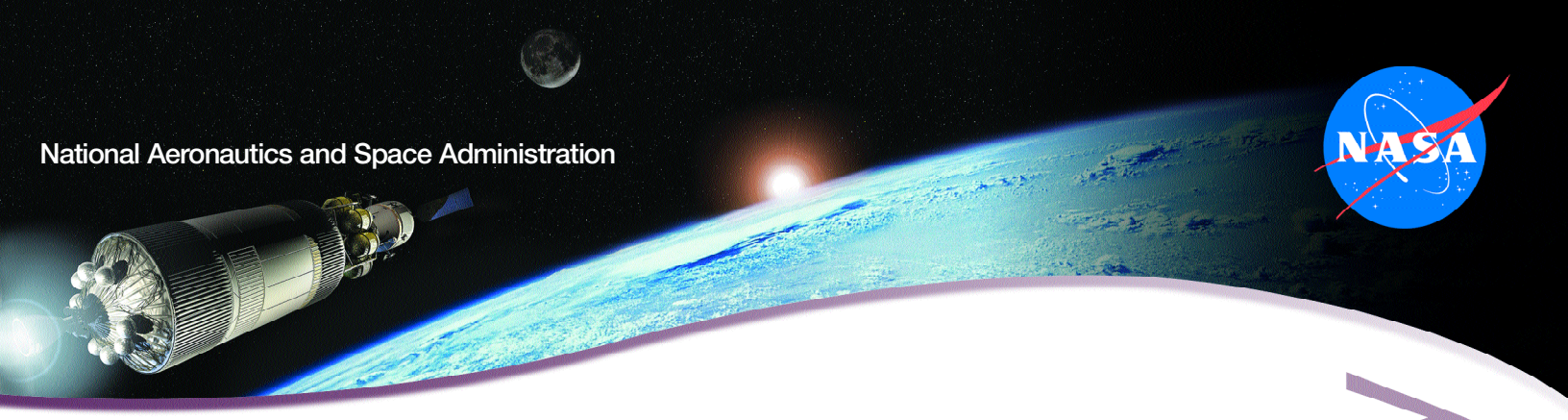


Lunar Operations Analyzer

Applying Systems Engineering to Lunar Surface Systems Operations

About the Technology

The Lunar Operations Analyzer (LOA) is a user-friendly systems engineering and integration tool for lunar surface operations. It is an Excel-based, analytical framework that integrates:

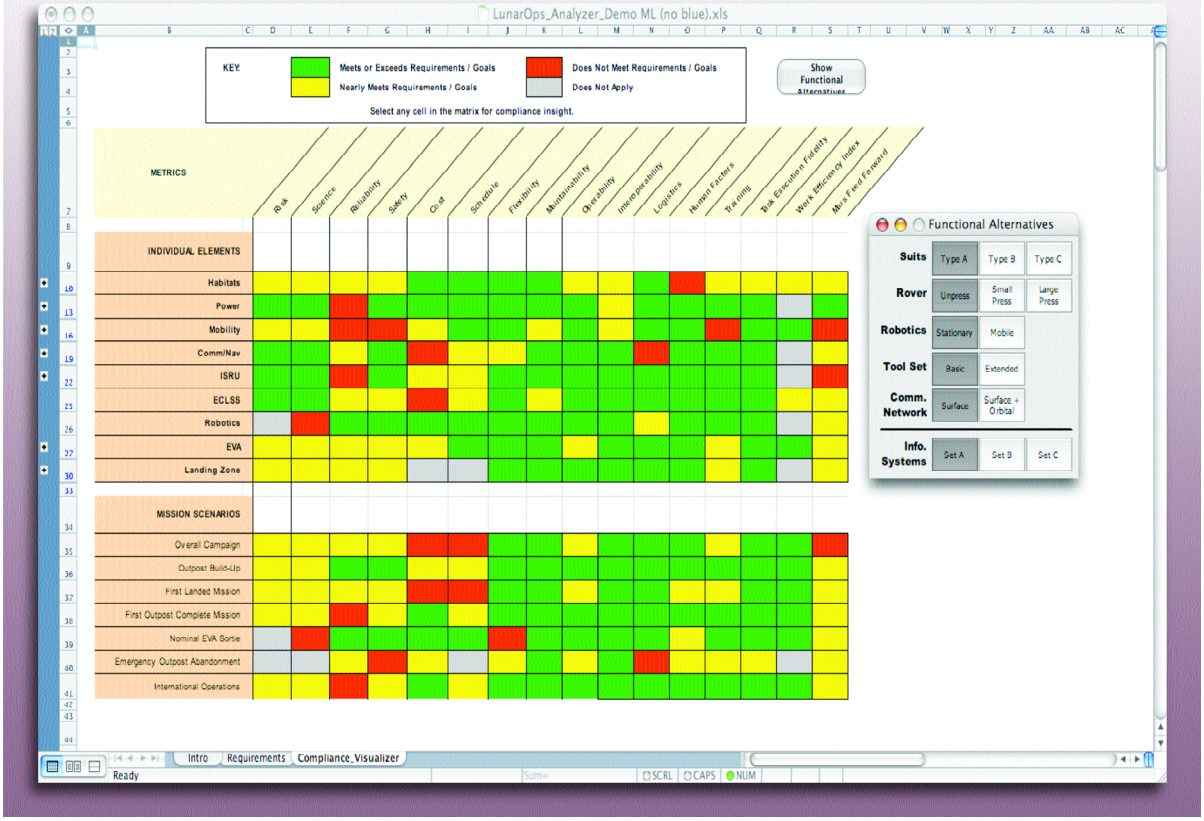
- Lunar surface system elements
- Mission scenarios
- Operational metrics
- Technology configurations

The user interface contains mission and requirements definitions as well as a *visualizer* – an easily comprehensible color-coded matrix that provides a unified systems-level analytical view based on user-chosen system/technology configurations. The "back-end" contains data for each lunar surface element. The user can modify any data and use the visualizer to perform "what if" analyses under a variety of configurations and mission scenarios to ensure requirements compliance.

See reverse side

Surface Ops Systems Engineering Analyzer

(Example)



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LOA

Benefits of the Technology: At-A-Glance

- Applies systems engineering to lunar surface systems operations.
- Facilitates comprehensive quantitative analysis.
- Integrates all aspects of systems and operations.
- Easily modified to meet a variety of needs.
- Easily integrates with other tools and analysis results – including Cradle.
- Easy-to-use Excel-based format provides unified interrelated system-wide view.

Significance of the Technology

Human lunar missions will be complex, costly, and dangerous. The highest levels of the Constellation Program Office recognize the need to better assess what and how missions will be conducted on the lunar surface. To ensure safety, success, return on investment, and life-cycle efficiencies, designers and mission planners will have to be proactive and systemic when integrating operations. They will have to know, for example, whether surface elements such as spacesuits, habitats, rovers, power and information systems, and other interrelated surface elements, meet operational needs under a diverse set of configurations and scenarios.

The LOA can help address those challenges by evaluating surface elements against different metrics, including safety, operability, interoperability, maintainability, logistics, human factors, work efficiency index, science, and international considerations. With this systems-integration tool, they can determine operational requirements and overall system sensitivities. They can easily apply operations systems-engineering methods to lunar surface systems, resulting in integration across a wide variety of factors to provide a broad system-level perspective – including the relation to mission control.

Uses At-A-Glance

- Requirements definition, tracking, and analysis
- Operations integration and impacts
- Gap analysis
- Individual element design
- Operations concept definitions
- Architecture-level trades
- Risk mitigation
- Technology infusion
- System complexity management (e.g. sensitivity analysis, complexity reduction)

Future Plans

A prototype, with a subset of the needed data and functionality, is currently available. Developers plan to continue building the tool to determine and quantify all relevant metrics, describe all elements and mission scenarios to the level of technical specification required for analyses, and enumerate all the relevant functional and technical alternatives to conduct a variety of "what if" analyses.

Contact:

Mark.L.Lupisella@nasa.gov

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